

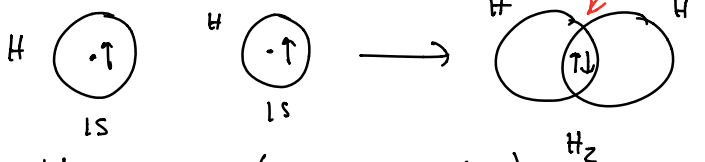
Today: Valence Bond (VB) Theory.

① VB

- involves quantum mechanics
- describes and explains chemical bonding.
- accounts for the shape of the molecule

② Guiding principles

- covalent bond \rightarrow formed by overlap of orbitals

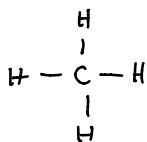


- overlap should be maximum (maximum overlap)

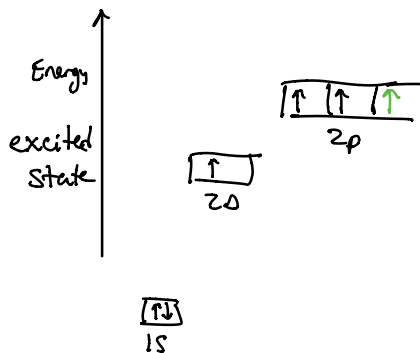
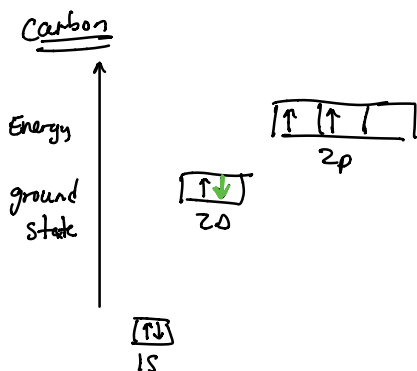
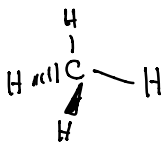
- use a process of combining and mixing existing orbitals to make new ones. (hybridization)

③ The case of Methane CH_4

Lewis structure

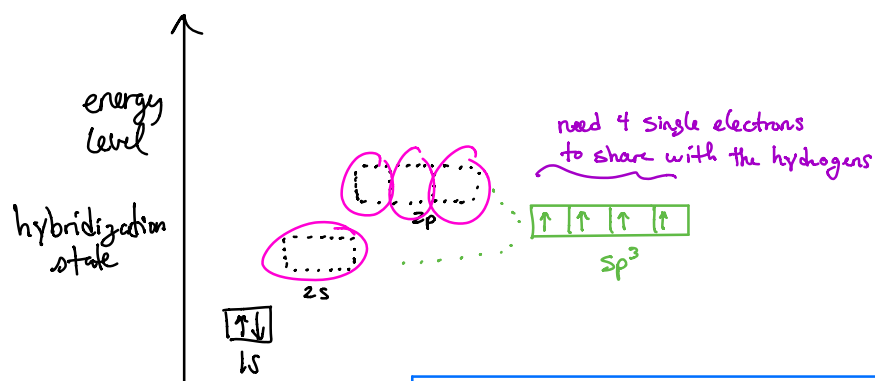


"3D" view

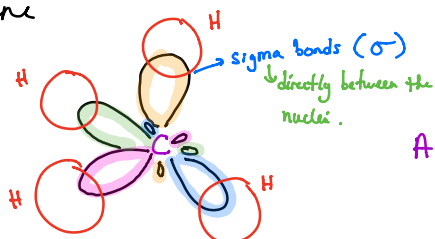


* Carbon will combine one s orbital with three p orbitals

$$s + p + p + p = sp^3$$

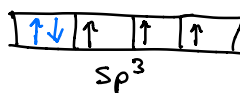
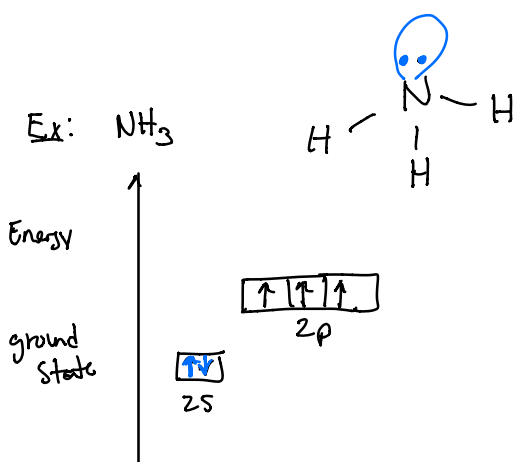


Methane



Methane: An example of hybridization

- mixing orbitals
- overall # of orbitals and electrons stay the same
- energy level falls between the energies of the combined orbitals
- the hybridized orbitals have EQUAL energy.



(*) Lone pairs NEED to be hybridized.

Ex: H_2O .

